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Research Article, Review

The Effect of Geometry Teaching Designed with the Developed Mobile Application on the Academic Achievement of the Students*

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Abstract –In order to ensure active participation of students in the lessons during distance education period, different learning tools were sought. For this purpose, within framework of the ADDIE design model, it was desired to develop a mobile application called GeoHepta to be used in learning the 7th grade mathematics course Geometry and Measurement learning field subjects. The study was carried out in the distance education process with 7th grade students in the 2020-2021 academic year. The research was carried out with a quasi-experimental design. In the study, "Geometry and Measurement Learning Field Achievement Test" was used. As a result of the research, a significant difference was reached between the post-test scores of the students in the experimental group, in which the mobile application-supported teaching was implemented, and the control group students, in which the textbook-based teaching was implemented. While there was a significant difference between the pre-test post-test scores of the experimental group students, there was no significant difference between the pre-test post-test scores of the control group students.

Key words: geometry education, mathematics achievement, ADDIE design model, mobile learning, distance education

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* This study was produced from the first author's doctoral dissertation.

Introduction

It is important to plan the activities to be carried out by addressing individual differences while teaching. Creating classroom environments that will enable individuals to develop not only their cognitive behaviors related to academic success but also their affective behaviors towards lessons supports success. Bacanlı (2006) revealed that affect has some indicators in the field of cognition. It is stated that while cognition takes action, the concept of affect affects this situation and creates awareness. In this direction, cognitive behaviors may vary according to the state of affective behaviors. Depending on the development of affective features, cognition can act as developed.

Today, generations of students studying at different levels from pre-school to university level differ. The students who will form our next generation who receive education in today's pre-school can be expressed as the Alpha generation (2010-2030), and the students who are educated at secondary school and other levels can be expressed as the Z generation (2000-2021). The generation in which the students are born affects which features of them are more developed, their perspectives on events, and their cognitive and affective behaviors. Educational environments can be arranged according to the generations of students. Considering the generation characteristics of the students, it is necessary to organize the learning environments in the school in a way that will appeal to individual differences in order to reach the specified goals. In order to ensure the effective education of generations, different strategies, methods and techniques can be used in the teaching process according to the teaching objectives and content of each branch of science. Educational designers can use generational differences as a meaningful variable in examining the effectiveness of different practices in the process of developing instructional design according to the differences between generations (Desai & Lele, 2017). It is stated in the curriculum that which dimensions of the abstract concepts in mathematics will be taught according to each grade level. In order to learn mathematics in line with the objectives of the mathematics curriculum, a learning environment can be created with different teaching methods and strategies in learning environments. Depending on the developments in education from past to present, teachers can use different teaching strategies, methods and techniques in teaching mathematics. Instructional strategies are expressed as an approach that guides the lessons in the learning process to reach the goals determined in the classroom and determines the use of methods, techniques and equipment (Yılmaz & Sünbül, 2003). Instructional strategies are generally classified as presentation strategy, discovery teaching strategy, inquiry-based teaching strategy and collaborative teaching strategy. After the teaching strategies are determined, it is determined which teaching

method will be used in order to ensure that the behaviors that will be gained to the students are carried out according to a certain plan. The most commonly used teaching methods are lecture, question-answer, demonstration, group discussion, role playing, case study. Depending on the teaching methods, the ways to be used in order to realize the teaching are determined by the teaching techniques. Techniques such as brainstorming and drama are used to implement teaching methods (Ocak, 2015). Teachers can also benefit from instructional design models to address individual differences in instructional environments. Instructional designs are concerned with how learning areas are taught. Instructional design is shaped according to the design steps in order to ensure the best learning and teaching. Based on the assumption that each individual in the target audience has to learn a determined subject within the definition of instructional design, it is the detailed planning of the development of instruction with the help of the strategies, the equipment or technology that the designer will use in line with the determined objectives (Ocak, 2015). Different learning design models are used while creating instructional designs. With the dissemination and development of theories and practices related to learning, the difference has been made. Some of the instructional design models that can be applied in different ways are: Kemp, Morrison and Ross (1994) model, Dick, Carey and Carey (1996) model, Seels and Glasgow (1998) model, ADDIE model, ARCS model, ASSURE model. While deciding which model to use, attention is paid to the instructional problem addressed, the situation of the target audience, and how behavioral, cognitive and constructivist approaches are used in the models. Instructional design models can be selected depending on the learning situation. Teachers can choose the instructional design according to the learning outcome and learning situation they aim to gain in teaching. Instructional design models are generally shaped according to similar steps. Each instructional design model includes a specific instructional strategy, instructional strategy instructional methods, instructional methods instructional techniques. Although instructional design models have different features, all of them include analysis, design, development, implementation and evaluation steps. Instructional design models are shaped according to the specified steps. Instructional design models are used to give form and concreteness to an existing phenomenon, conceptual relations and methods (Ocak, 2015). Instructional design models ensure that each instructional situation is fully fulfilled by successive processes, without skipping the steps of designing the conceptual relationships that they want to convey. However, in some models, it is possible to skip some steps, while focusing more on certain steps, depending on the characteristics of the model. In this respect, instructional design models may differ. According to the comparison of

instructional design models in this respect, the models used can be classified as linear and cyclic models. While linear models consist of successive steps, circular models do not mention a starting or ending point. While models such as ASSURE and the Instructional Development Institute model are examples of the linear model, models such as the Kemp model and the American Air Force model are examples of the circular model (Ocak, 2015). Although instructional designs have differences in these aspects, they have common components (Richey, 1986). In all teaching models, determining the needs of the learners, determining the goals and objectives, determining the evaluation methods, designing the presentation styles, making the pilot applications of the created system, and reviewing the system are implemented as a common component (Richey, 1986). Instructional design models can show similar components and different features of the process with visual models in order to show the whole process in detail at first glance. By looking at these models, it is possible to have information about how the design process of the model progresses. Teachers can create a teaching environment according to an instructional design model in order to create the most appropriate teaching environment in line with the goals they want to achieve. In mathematics teaching, the teaching environment can be designed according to different instructional design models, so that students can reach the desired goals in teaching the subjects. When we look at the studies on instructional design models that can be used in mathematics teaching in the literature, it is seen that there are studies that are carried out with different design models depending on features such as teaching level, goals, and problem status (Karakış, Karamete, & Okçu, 2016; Özdemir & Uyangör, 2011; Yıldız & Koçak Usluel, 2016). Özdemir and Uyangör (2011) created an instructional design model for mathematics education based on the ASSURE model and supported by the Dick and Carey Model in their study. They made suggestions for the model they developed to be used in different areas in mathematics teaching. In their study, Karakış, Karamete and Okçu (2016) examined the effects of computer-assisted instruction on students' attitudes towards mathematics lessons and computer-assisted instruction towards learning mathematics. The computer software used was designed to teach fractions to fourth graders based on the ASSURE model and the ARCS Motivation Model. As a result of the study, it was determined that the academic achievement of the students increased and their attitudes towards computer assisted education changed positively. When the studies are examined, the integration of technology in mathematics teaching is included according to different instructional design models. In this direction, in the research, it was aimed to examine the effects of a mobile application-based teaching environment by developing a mobile application named GeoHepta for the 7th grade mathematics lesson according to the ADDIE design model, which is one of the design models.

The ADDIE design model is formed by combining the initials of the steps that make up this model. These steps are Analysis, Design, Development, Implementation, Evaluation. ADDIE instructional design model; defines the stages of these five steps as the process of using instructional design to create purposeful learning lessons. The ADDIE approach, which is one of the most effective product development ways of today, is expressed as a suitable model for educational products and other learning resources (Branch, 2016). In the research carried out, a needs analysis was carried out within the scope of the research, starting from the analysis step of the ADDIE design model steps. As a result of the analysis of the interviews with the 8th grade students and mathematics teachers, it was decided to create a teaching environment by making use of technology, since they knew the subjects related to the 7th grade Geometry and Measurement learning field. As a result of the needs analysis, it was requested to use it in mathematics teaching by developing a mobile application in order to create a teaching environment suitable for the age of the students. While the content of the mobile application to be developed in the design stage was being prepared, the mobile application was developed as both a web page and a mobile application under the name GeoHepta in the development stage. The developed mobile application is designed to be used on phones or tablets. In the application step, teaching was carried out by using the mobile application. In the evaluation step, the effect of the teaching, which is carried out by using the mobile application, on the success of the students was investigated.

Problem Statement

In accordance with the purpose of the research, the problem statement was determined as follows: “What is the effect of the 7th grade students' academic achievement of the 7th grade students on the academic achievement of the subjects in the field of Geometry and Measurement designed according to the ADDIE instructional design model?”

Sub-Problems

Experiment group students who study in the learning environment designed according to the ADDIE instructional design model in the teaching of subjects related to the 7th grade Geometry and Measurement field, and the control group students where the textbook-based teaching is carried out,

i) Is there a significant difference between their academic achievements according to the pre-test measurement scores of the "7th grade Achievement Test for Geometry and Measurement Learning Field"?

ii) Is there a significant difference between their academic achievements according to the "7th grade Achievement Test for Geometry and Measurement Learning Field" post-test measurement scores?

iii) Is there a significant difference between their academic achievements according to the pre-test and post-test measurement scores of the "7th grade Achievement Test for the Learning Field of Geometry and Measurement"?

Literature

ADDIE Instructional Design Model

Instructional design; It is stated as an iterative process that includes the stages of determining performance goals, deciding on teaching strategies, selecting or creating the environment and material, and evaluating (Branch, 2016). The ADDIE model, which is one of the instructional design models, was first introduced as a general model in 1975. ADDIE design model, which is one of the systematic instructional design models consisting of five stages, consists of the stages of Analysis, Design, Development, Implementation, and Evaluation. ADDIE instructional design model; defines the stages of these five steps as the process of using instructional design to create purposeful learning lessons. It is seen that the steps of the ADDIE design model are gradual, and a relationship is established with the previous step depending on the work done after each step. As one of the most effective product development ways for educational products and other learning resources, the ADDIE approach is stated as a suitable model (Branch, 2016). In line with the applicability of the ADDIE design model, research has been carried out at different levels of education (Arkün & Akkoyunlu, 2008; Berigel, 2017; Burmabıyık, 2014; Wahab, Abdullah, Mokhtar, Atan, & Abu, 2017). To summarize these studies briefly, there are researches based on the ADDIE design model at different levels. In the research of Burmabıyık (2014), a learning material was developed for the teaching of solid objects in mathematics lesson according to the steps of the ADDIE instructional design model. As a result of the research, the students stated that they liked the developed material and wanted to use it. According to the ADDIE instructional design model for hearing-impaired students, Berigel (2017) found that learning environments created as a result of technology-supported mathematics learning environments increased students' interest in the course and had positive effects on their success. Wahab et al. (2017) stated in their studies that while learning mathematics through exploration, opportunities to experiment should be given and geometric shapes should be examined on their own. In this direction, a learning strategy called LSPE-SUM was designed to help students develop their visual spatial skills and geometric thinking, step by step, with a learning strategy using the 3D SketchUp Make dynamic software for

Geometry. As a result of the analysis of students' opinions, it was concluded that LSPE-SUM helped to develop geometric thinking and served its purposes well in a pedagogical functional way.

Mobile Learning

Mobile learning is a widely used technology-assisted teaching method. According to Semetzidis (2013), mobile learning is learning through mobile devices. Today, with mobile learning, instant communication without time and place restrictions allows individuals to carry digital files in their pockets. Educators or individuals can direct the learning process that takes place with mobile technologies. Mobile learning; It can take place both inside and outside the classroom. Mobile learning supports informal learning as it provides learning opportunities outside the classroom (Crompton, 2013). Thus, it opens the way for learning to be provided everywhere. When the literature is examined, there are studies (Kestel, 2020) on the use of mobile learning-based research in different fields of educational sciences (Berberoğlu, 2020; Sönmez, 2018) and other branches of science in the teaching and application stages. However, it has been found that there are few studies in the field of mathematics teaching among the researches on mobile assisted teaching. Yıldız (2020), one of these studies, carried out a scale development study on the examination of mobile learning acceptance of secondary school students in mathematics learning. Koparan and Kaleli Yılmaz (2020) examined the opinions of pre-service mathematics teachers about the learning environment supported by mobile learning. Again, when studies abroad are examined, Supandi, Ariyanto, Kusumaningsih, and Aini (2018) aimed to examine the role of mobile phone application in mathematics education in their studies. After the use of the mobile application, it was observed that the students found the application interesting and showed high success.

Depending on the changing conditions in current life, how students will learn and learning environments can also change. Today, where technology is an integral part of life, mobile phones are in the hands of every individual. In the conducted research, it was concluded that a learning environment should be created by utilizing technology according to the views obtained from the needs analysis according to the ADDIE design model. Therefore, it is aimed to investigate how an instructional design based on mobile learning, which has a place in everyone's life, changes the academic success of students.

Method

Research Model

In this research, a quasi-experimental design, which is one of the quantitative research methods, was used to determine the effects of the teaching carried out based on the GeoHepta mobile application developed according to the ADDIE instructional design model of 7th grade students.

Working Group

The research was carried out with 7th grade students studying in a secondary school in the Central Anatolia Region in the 2020-2021 academic year during the distance education process due to the Covid-19 pandemic, by obtaining the necessary ethics committee permission. The experimental group consisted of 26 students and the control group consisted of 21 students.

Data Collection Tools

Achievement Test for the Learning Field of Geometry and Measurement

Within the scope of the research, a multiple-choice test with 28 questions was prepared in order to determine the academic success of the students in the mathematics course. During the development process of the achievement test, a test consisting of 35 questions was created in order to examine each achievement with at least 2 questions. The pilot application of the draft test was made on 8th grade students who were learning the subjects. After the pilot application, the analysis of the items in the test was provided. As a result of item analysis, the test was finalized and the achievement test consisted of 28 questions. The KR-20 reliability coefficient of the developed test was found to be 0.746. After the pilot application, 8 questions were removed from the draft test questions prepared, and the achievement test was given its final form as 28 questions.

Analysis of Data

In the research, 7th grade Geometry and Measurement Learning Field Achievement Test was applied in order to determine the success of the experimental and control group students before and after the application and to examine whether there is a statistically significant difference between their success. While evaluating the questions in the Mathematics Course Achievement Test related to Geometry and Measurement Learning Field, 1 for each correct answer; 0 points is given for each wrong answer and unanswered question. Each student's test items were read according to the specified scoring. Accordingly, it was determined that the highest score that could be obtained from the achievement test would be 28 and the lowest score would be 0.

The scores obtained depending on the pre-test and post-test applied to the students were analyzed with the SPSS program. In the analysis of the data within the same group, the t-test was used for the related samples, and the t-test was used for the unrelated samples in the

between-group analysis. Since the distribution of the pre-test and post-test scores obtained from the applied scales showed a normal distribution, the analysis was made using parametric tests. For this reason, independent samples t-test (t-test for unrelated samples) was used to compare achievement test scores between the experimental and control groups. The dependent sample t-test (t-test for related samples), which is one of the parametric tests, was used to determine the relationship between the pre-test and post-test scores of the experimental group students and the pre-test and post-test scores of the control group students. With the t-test for dependent samples, the significance between each group according to the pre-test and post-test scores was examined. From the findings obtained as a result of the analysis, statistical differences between the academic achievements of the experimental group students who had the learning process in the learning environment created with the GeoHepta mobile application developed according to the ADDIE instructional design model and the control group students who had the learning process in the textbook-based learning-teaching environment were determined.

Findings and Discussions

The research problem is "Does the 7th grade students' teaching of the subjects in the field of Geometry and Measurement designed according to the ADDIE instructional design model have an effect on the success of the students in geometry?" expressed as. Findings related to the sub-problems of the research and interpretations of the findings are given under the following headings, respectively.

Findings and Comments on the First Sub-Problem

"The 7th grade Achievement Test Related to Geometry and Measurement Learning Field" pre-test measurement scores of the Experiment group students who were educated in the learning environment designed according to the ADDIE instructional design model in teaching the subjects related to the 7th grade Geometry and Measurement learning field, and the control group students where the textbook-based teaching was carried out. Is there a significant difference between their academic achievements?

"In order to reach the findings of the sub-problem, it was examined whether all the assumptions of the t-test for unrelated samples were met. These assumptions are:

1) The measurements or scores of the dependent variable are in the interval or ratio scale, and the mean of the two groups for comparison belongs to the same variable.

2) The distribution of the measurements of the dependent variable is normal in both groups.

3) Samples to compare mean scores are unrelated. (Büyüköztürk, 2014; p. 39)

They are the measurements obtained from the pre-test application of the scores of the dependent variable. Since the measurement data obtained is in the ratio scale, the first assumption is provided.

In the comparison of the mean scores of the same variable of two independent groups; According to the Shapiro Wilk test results of the measurements in each group, the mean scores of the students in the experimental (p=.054>.05) and control group (p=.236>.05) show a normal distribution. According to the Levene test result, the variances of the distributions were found to be equal (F=2.814; p>.05). Due to its assumptions, the t-test was applied for unrelated samples. Table - 1 below shows the t-test result for the comparison of the achievement test pre-test mean scores of the experimental and control groups.

Table 1. Results of t-test for unrelated samples according to pre-application data of Achievement Test Related to Geometry and Measurement Learning Field

Test Name	Measurement	n	Arithmetic mean	Ss	Sd	t	p
Achievement Test	Experiment	26	9.54	3.34	45	.306	.761
	Control	21	9.81	2.56			

The results of the t-test for unrelated samples are given in Table 1. Looking at the values in the table, the difference between the experimental and control group achievement test scores (X_d=9.54, X_k=9.81) was not found statistically significant (t=(45)=.306, p>.05). From these results, it can be said that the students of the two groups are equivalent to each other in terms of achievement test pre-test scores before the application.

Findings and Comments on the Second Sub-Problem

"The 7th grade Achievement Test Related to Geometry and Measurement Learning Field" post-test measurement scores of the Experiment group students who were educated in the learning environment designed according to the ADDIE instructional design model in the teaching of subjects related to the 7th grade Geometry and Measurement learning field, and the control group students where the textbook-based teaching was carried out. Is there a significant difference between their academic achievements?

Assumptions of the t-test for unrelated samples are provided for comparing the mean scores of the same variable for unrelated samples. For this reason, unrelated samples t-test was performed. In Table 2 below, the t-test result for unrelated samples for the comparison of the achievement test post-test mean scores of the experimental and control groups is given.

Table 2. Results of the t-test for unrelated samples according to the last application data of Achievement Test Related to Geometry and Measurement Learning Field

Test Name	Measurement	n	Arithmetic mean	Ss	Sd	t	p
Achievement Test	Experiment	26	17.12	4.07	45	4.160	.000
	Control	21	12.76	2.81			

The results of the t-test for unrelated samples are given in Table 2. For unrelated samples, the difference between the mean achievement test scores according to the t-test (X_d=17.12, X_k=12.76) was found to be statistically significant (t=(45)=4.160, p<.05).

Findings and Comments on the Third Sub-Problem

The "7th grade Achievement Test for Geometry and Measurement Learning Field" pre-test and post-test were applied to the experimental group students who were educated in the learning environment designed according to the ADDIE instructional design model in teaching the subjects related to the 7th grade Geometry and Measurement learning field, and the control group students where the textbook-based teaching was carried out. -Is there a significant difference between their academic achievements according to test measurement scores?

The relationship between the pre-test and post-test measurements of the experimental group and control group students was examined separately.

Table 3. The results of the t-test for the related samples according to the pre-test post-test application data of the experimental group Achievement Test Related to Geometry and Measurement Learning Field

Test Name	Measurement	n	Arithmetic mean	Ss	Sd	t	p
Achievement Test	Pre-test	26	9.54	3.34	25	-10.093	.000
	Post-test	26	17.12	4.07			

According to Table 3, there is a significant difference between the pre-test and post-test scores of the experimental group students.

Table 4. The results of the t-test for the related samples according to the pre-test post-test application data of the Achievement Test Related to the Learning Field of Geometry and Measurement in the control group

Test name	Measurement	n	Arithmetic mean	Ss	Sd	t	p
Achievement Test	Pre-test	21	9.81	2.56	20	-4.070	.001
	Post-test	21	12.76	2.81			

According to Table 4, there is a significant difference between the pre-test and post-test scores of the control group students.

Discussion, Conclusions and Suggestions

In the conducted research, pre-test and post-test research method with control group was adopted in a quasi-experimental design. In the quasi-experimental research process, before and after the implementation process, the academic success of the students was determined by the Achievement Test in the Field of Geometry and Measurement Learning. According to the analysis of the achievement test pre-test scores of the experimental and control groups before the applications, it was understood that the two groups were equivalent in terms of success.

According to the achievement test pre-test scores, the mean score of the experimental group students was 9.54 and the mean score of the control group students was 9.81. According to the t-test results for unrelated samples, it was concluded that there was no significant difference between the pre-test scores of the two groups. After the completion of the applications in the research process, the achievement test was applied to both groups as a post-test. After the application, the average post-test achievement score of the experimental group was found to be 17.12, and the average of the post-test achievement score of the control group was 12.81. According to the t-test results for unrelated samples, there was a significant difference between the post-test scores of the two groups.

The difference between the achievement test post-test mean scores was statistically significant and found in favor of the experimental group. This result; It has been shown that the students who have undergone the learning process by using the mobile application named GeoHepta are more successful than the students who have had the learning process based on the textbook. This shows that the use of mobile applications in mathematics lessons increases the success of students. As a result of the research, it was determined that the scores of the two groups from the post-test increased compared to the scores they reached from the pre-test. To determine whether this increase in the scores of the groups was statistically significant, the t-

test was applied for the related samples. From the obtained results, it was concluded that the increase in the mean scores of both groups was statistically significant. When the studies in the literature are examined, it is seen that the use of mobile applications in the learning process increases the academic success of the students in the mathematics course (Aktaş, Bulut, & Aktaş, 2018; Baş & Ulum, 2019; Çetinkaya, 2019; Fabian, Topping & Barron, 2018; Kazu, Aral & Mertoğlu, 2016; Sincuba and John, 2017) are available. In the literature, there are few studies comparing the effect of teaching by using mobile applications in the learning process on the academic success of students and the effects of using learning materials other than mobile applications on the academic achievement of students. Kazu et al. (2016); no significant difference was found in the participation and motivation of the students in the experimental and control groups of the 11th grade students in the mathematics teaching using a mobile device. In their study, Meriçelli and Uluyol (2016) examined the success and motivation of students who were taught in a mobile supported learning environment and web supported learning environment. According to the results of the study, no significant difference was found between the academic achievement and motivation scores of the students studying in web-supported blended and mobile-assisted blended learning environments.

When the results of this study are evaluated together with the research findings in the literature, it can be said that the application named GeoHepta, which provides the opportunity to learn on both the mobile application and the web page, has a positive effect on the academic success of the students in the mathematics course. Before the research application, it was determined that the experimental and control groups were equivalent to each other in terms of success. In the findings part of the second sub-problem of the study, a statistically significant difference was determined between the post-test scores of the two groups in terms of success. While there was no significant difference between the achievement test scores of the groups before the quasi-experimental study, there was a significant difference between the achievement test scores of the groups after the experimental study. In the findings of the third sub-problem of the study, there is a significant difference between the pre-test and post-test scores of the experimental group students. According to the achievement test pre-test and post-test scores, the post-test scores of the experimental group were found to have a higher average than the pre-test scores. There is also a significant difference between the pre-test and post-test scores of the control group students. The post-test and pre-test scores of the control group students were found to be closer to each other than the experimental group students' scores. From the obtained results; It is understood that the use of GeoHepta in the application process in the mathematics

course within the scope of the experimental research contributes more positively to the academic success of the students. According to the results of the research, it can be stated that the positive effect of GeoHepta on success is related to the following features:

• With GeoHepta, which was developed according to the design model, the students were provided with the opportunity to reach the Geometry and Measurement learning field acquisitions in accordance with their individual learning speeds, and to examine and repeat the activities whenever they want. With this feature of GeoHepta, it can be said that students benefit from the activities and study questions in the application from anywhere in the classroom or outside of the classroom via mobile devices, which provides an advantage compared to students who have undergone a textbook-based learning process.

• Çetinkaya (2019), Gök (2020); In their study, they stated that the correct use of mobile application tools in technology-assisted mathematics education has a positive effect on students' mathematics achievement. In the developed mobile application, the dynamic mathematics software is arranged in a way that enables students to discover the conceptual features of the subjects through activities during the learning process. In this way, it can be said that students are able to establish dynamic connections between representations on the GeoGebra 6.0 software related to the concepts and make associations by showing the ability to think analytically interactively. For example; It is seen that they can discover the angle properties of polygons according to the changes in the representations by following the properties of the polygons formed according to the changing number of sides in the graphic representation on the software, by following the algebraic representation of the association between the number of sides and angle measures of the polygons. In this way, allowing students to discover the topics and enable them to learn meaningfully through similar activity questions can be a positive factor in increasing the success of the students.

• The interactive structure of GeoHepta provides students with an interactive learning environment. With this structure of GeoHepta, students progress by getting feedback on the results of their actions during the learning process. Feedback can be provided while learning the concepts through the software and solving the evaluation questions created with both web 2.0 tools and the mobile application. In this way, students have the opportunity to make instant evaluations in their learning processes, and they can reach generalizations by shaping their thoughts conceptually.

• In the experimental process, it is seen that the students have a desire to enter the GeoHepta application and solve the questions created with activities and web 2.0 tools on geometry topics. In particular, it was observed during the research that students resolved the evaluations made

with web 2.0 tools such as Kahoot and Socrative, eagerly and eagerly. It is thought that this factor has positive reflections on the success of the students. In the literature, there are various studies on the positive effects of technology-supported formative assessments (Socrative, Kahoot, Plickers, …) on students' participation in mathematics lessons (Wood, Brown, & Grayson, 2017; Zengin, Bars, & Şimşek, 2017)

Suggestions

Depending on the results of the research, some suggestions were made below.

• In the study, it was determined that the mobile learning environment created through the mobile application named GeoHepta was more effective on the academic achievement of the students than the learning environment based on the textbook. Based on this result, it is recommended that teachers use mobile applications in the lessons on the subjects included in the mathematics lesson for each grade level.

• Due to the Covid-19 pandemic, the research was piloted and the main application was carried out during the distance education process. When schools switch to face-to-face education by developing similar mobile applications, similar and different effects on learning can be investigated by applying them for learning purposes.

Geliştirilen Mobil Uygulamayla Tasarlanmış Geometri Öğretiminin Öğrencilerin Akademik Başarılarına Etkisi

Özet:

Uzaktan öğretim döneminde öğrencilerin derslere aktif katılımlarını sağlamak için farklı öğrenme araçları arayışlarında bulunulmuştur. Bu amaçla ADDIE tasarım modeli çerçevesinde 7. sınıf matematik dersi Geometri ve Ölçme öğrenme alanı konularının öğrenilmesinde kullanılmak üzere GeoHepta isimli bir mobil uygulaması geliştirilmek istenilmiştir. Çalışma, 2020-2021 eğitim öğretim yılında 7. sınıf öğrencileriyle uzaktan öğretim sürecinde yapılmıştır. Araştırma yarı deneysel desen ile gerçekleştirilmiştir. Çalışmada "Geometri ve Ölçme Öğrenme Alanına İlişkin Başarı Testi" kullanılmıştır. Araştırma sonucunda mobil uygulama destekli öğretimin gerçekleştiği deney grubu öğrencileri ile ders kitabına dayalı öğretimin gerçekleştiği kontrol grubu öğrencilerinin son test puanları arasında anlamlı bir farklılığa ulaşılmıştır. Deney grubu öğrencilerinin ön-test son-test puanları arasında anlamlı bir farklılık görülürken, kontrol grubu öğrencilerinin ön-test son-test puanları arasında anlamlı farklılık görülmemiştir.

Anahtar kelimeler: geometri eğitimi, matematik başarısı, ADDIE tasarım modeli, mobil öğrenme, uzaktan öğretim

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